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# **Breakeven for New Crop Options (BENCO) model for the Adoption of Guayule into Southwest Producers Current Operation**

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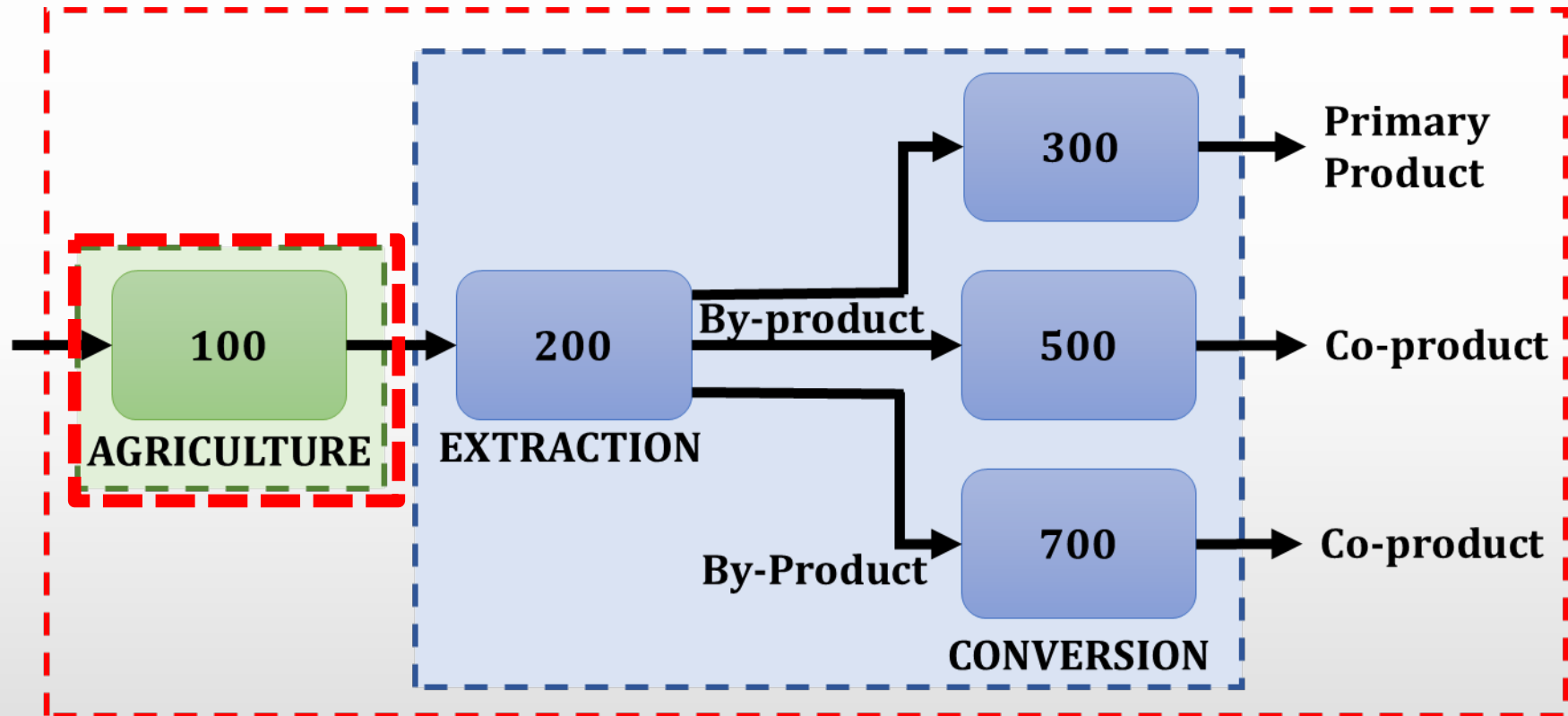


# System Modeling



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***Fully Integrated energy and mass balance cross the entire value chain***



# Introduction

BENCO was developed to assist growers in forecasting the impact of adding new crops. The model evaluates the financial impacts of water restrictions to farms, and how alternative crops can change available water and net farm incomes. The model includes income and expense budgets for guayule, hemp, sorghum, guar, durum wheat, spring barley, silage corn, cotton and alfalfa hay.

- *BENCO allows growers to change crops and cropping systems to observe the tradeoffs of available water and net returns.*
- *Farm level analysis provides an insight view of making decision of growing guayule, under static situations.*
- *Whole Farm Analysis is critical when adopting new crops into existing production systems.*



# AZ Whole Farm Acres and Crop Returns



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Acres in Case Farm	<b>600.0</b>	% Irrigation Type		
CROP	% of farm	Acres	Flood	Drip
<b>Guar</b>	<b>0%</b>	0	<b>100%</b>	0%
<b>Guayule</b>	<b>15%</b>	90	<b>100%</b>	0%
Cotton	<b>10%</b>	60	<b>100%</b>	0%
White Corn	<b>0%</b>	0	<b>100%</b>	0%
Sorghum	<b>5%</b>	30	<b>100%</b>	0%
Barley	<b>5%</b>	30	<b>100%</b>	0%
Wheat	<b>5%</b>	30	<b>100%</b>	0%
Wheat+Alfalfa Establishment	<b>10%</b>	60	<b>100%</b>	0%
Alfalfa Hay	<b>50%</b>	300	<b>100%</b>	0%
	100%	600	100%	0%

<b>Crop Returns</b>	Unit	\$/Unit	Quantity Per Acre
Guar	Pounds	<b>\$ 0.12</b>	<b>1,400.0</b>
Guayule - Biomass	Pounds	<b>\$0.08</b>	<b>22,000.0</b>
Guayule - Rubber Content	\$/kg-rubber	<b>\$0.00</b>	-
Cotton Lint	Pounds	<b>\$0.83</b>	<b>1,200.0</b>
Cotton Seed	Pounds	<b>\$0.10</b>	<b>1,600.0</b>
White Corn	CWT	<b>\$6.61</b>	<b>70.0</b>
Sorghum	CWT	<b>\$7.05</b>	<b>50.0</b>
Barley	CWT	<b>\$10.31</b>	<b>30.0</b>
Wheat	CWT	<b>\$9.17</b>	<b>35.0</b>
Alfalfa Hay	Ton	<b>\$218.00</b>	<b>6.5</b>

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## *Change Irrigation Systems.*

<b>TOTAL ACRES IN FARM</b>		<b>1,500</b>	<b>% Irrigation Type</b>		
<b>CROP</b>	<b>% of farm</b>	<b>Acres</b>	<b>Flood</b>	<b>Drip</b>	<b>Sprinkler</b>
<b>Guayule</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Guar</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Hemp for CBD Oil</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Hemp for Grain</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Hemp for Fiber</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Irr. Water Reduction: Set-asi</b>	<b>40.0%</b>	600	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Cotton</b>	<b>20.0%</b>	300	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Corn Silage</b>	<b>3.0%</b>	45	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Sorghum</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Spring Barley</b>	<b>6.0%</b>	90	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Durum Wheat</b>	<b>11.0%</b>	165	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Alt Crop #1</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>
<b>Alt Crop #2</b>	<b>0.0%</b>	-	<b>100%</b>	<b>0%</b>	<b>0%</b>

## *Track Irrigation Water Available*

	P	Q	R	S	T	U
<b>Irrigation Water Available, Used, and Saved/Deficit</b>						
	Unit	Total Farm	Quantity Flood	Quantity Drip	Quantity Sprinkler	
Total Available Water	ac ft	<b>4,125</b>				
Total Water Used			3,750	0	0	
Total Water Saved or Deficit	ac ft	375				



# AZ Whole Farm Equipment Estimates

	Purchase					Fuel Use				Repair	Replacement	Acres per	Acres per		Hours/year	LABOR	REPAIRS	REPLACE
	Price	Budget Life	Repair Factors		RFV Factor	per Hour	Width	Speed	Efficiency	Cost/Hour	Cost/Hour	Hour	Year	Tractor		\$/Acre	\$/Acre	\$/Acre
Machinery			RF1	RF2														
175 HP 4WD Tract	\$180,000	15	0.003	2.00	0.1914	8	N/A			2.19	35.95	N/A	1,740	1	270		\$ 0.34	\$ 5.58
125 HP 4WD Tract	80,000	10	0.003	2.00	0.2524	4	N/A			1.15	12.46	N/A	1,320	2	480		\$ 0.42	\$ 4.53
V-Ripper	22,000	10	0.28	1.00	0.2296		8.0	3.0	85	0.00	0.00	2.47	-	1	-	\$ 5.84	\$ 0.34	\$ 5.58
Offset Disk, 18'	30,000	15	0.18	1.00	0.2176		18.0	5.0	80	5.40	16.86	8.73	810	1	93	\$ 1.65	\$ 0.96	\$ 7.51
Drag, 18'	7,000	15	0.27	1.00	0.2176		18.0	2.3	85	1.89	3.71	4.27	420	2	98	\$ 3.39	\$ 0.86	\$ 5.40
Shank Chisel	17,000	15	0.28	1.00	0.2176		8.0	6.0	85	4.76	11.24	4.95	390	1	79	\$ 2.92	\$ 1.30	\$ 7.85
Moldboard Plow	24,500	15	0.29	1.80	0.2176		6.0	3.4	85	4.99	29.84	2.10	90	1	43	\$ 6.87	\$ 2.71	\$ 19.78
Landplane	18,000	15	0.18	1.00	0.2176		12.0	4.0	85	0.00	0.00	4.95	-	1	-	\$ 2.92	\$ 0.34	\$ 5.58
Float, 14'	7,000	15	0.18	1.70	0.2176		14.0	3.8	85	0.36	33.36	5.48	60	2	11	\$ 2.63	\$ 0.48	\$ 10.62
4-Row Lister	6,500	15	0.17	2.2	0.2176		10.0	4.0	80	0.31	14.61	3.88	90	1	23	\$ 3.72	\$ 0.42	\$ 9.34
Bed Shaper	6,500	20	0.18	1.70	0.2176		20.0	3.5	85	0.00	0.00	7.21	-	1	-	\$ 2.00	\$ 0.34	\$ 5.58
8-Row Planter	40,000	15	0.32	2.10	0.3379		20.0	5.5	65	1.66	170.02	8.67	90	1	10	\$ 1.67	\$ 0.53	\$ 25.19
8-Row Cultivator	22,000	10	0.17	2.20	0.2963		20.0	5.0	80	0.92	50.04	9.70	300	2	31	\$ 1.49	\$ 0.51	\$ 9.69
Drill	25,000	15	0.32	2.10	0.3379		20.0	4.7	70	3.78	32.74	8.01	270	2	34	\$ 1.80	\$ 0.89	\$ 8.62
Cotton Picker, 4-R	75,000	10	0.14	2.30	0.2524	12	10.0	3.2	70	0.61	501.12	2.68	30	2	11	\$ 5.39	\$ 0.65	\$ 191.43
Cotton Trailer, 8 B	5,500	15	0.16	1.60	0.2626		N/A	N/A	N/A	0.55	9.01	1.00	30	2	30	\$ 14.44	\$ 0.96	\$ 13.54
Shredder, 4 Row	12,000	15	0.28	1.40	0.1914		10.0	4.2	85	1.36	93.31	4.33	30	2	7	\$ 3.34	\$ 0.73	\$ 26.09
Combine	180,000	10	0.04	2.10	0.2524	13	30.0	4.0	85	1.35	616.20	12.36	270	N/A	22	\$ 1.17	\$ 0.11	\$ 49.84
Grain Cart	18,000	15	0.19	1.30	0.3497		N/A	N/A	N/A	2.45	35.73	12.36	270	1	22	\$ 1.17	\$ 0.54	\$ 8.47
Swather - Alfalfa H	75,000	15	0.06	2.00	0.1914	4	16.0	6.3	75	11.14	24.50	9.09	1,500	N/A	165	\$ 1.59	\$ 1.23	\$ 2.70
Baler - Alfalfa Hay	120,000	10	0.10	1.80	0.2824		16.0	4.0	75	25.60	33.40	5.82	1,500	2	258	\$ 2.48	\$ 4.82	\$ 10.27
Swather - Guayule	75,000	7	0.06	2.00	0.1914	4	16.0	0.65	75	0.00	0.00	0.95	-	N/A	-	\$ 15.27	\$ -	\$ -
Baler - Guayule	120,000	5	0.10	1.80	0.2824		16.0	0.65	75	0.00	0.00	0.95	-	2	-	\$ 15.27	\$ 0.42	\$ 4.53
Bale Wagon	8,500	10	0.16	1.60	0.2524	4	16.0	4.0	75	2.40	2.46	5.82	1,500	N/A	258	\$ 2.48	\$ 0.41	\$ 0.42

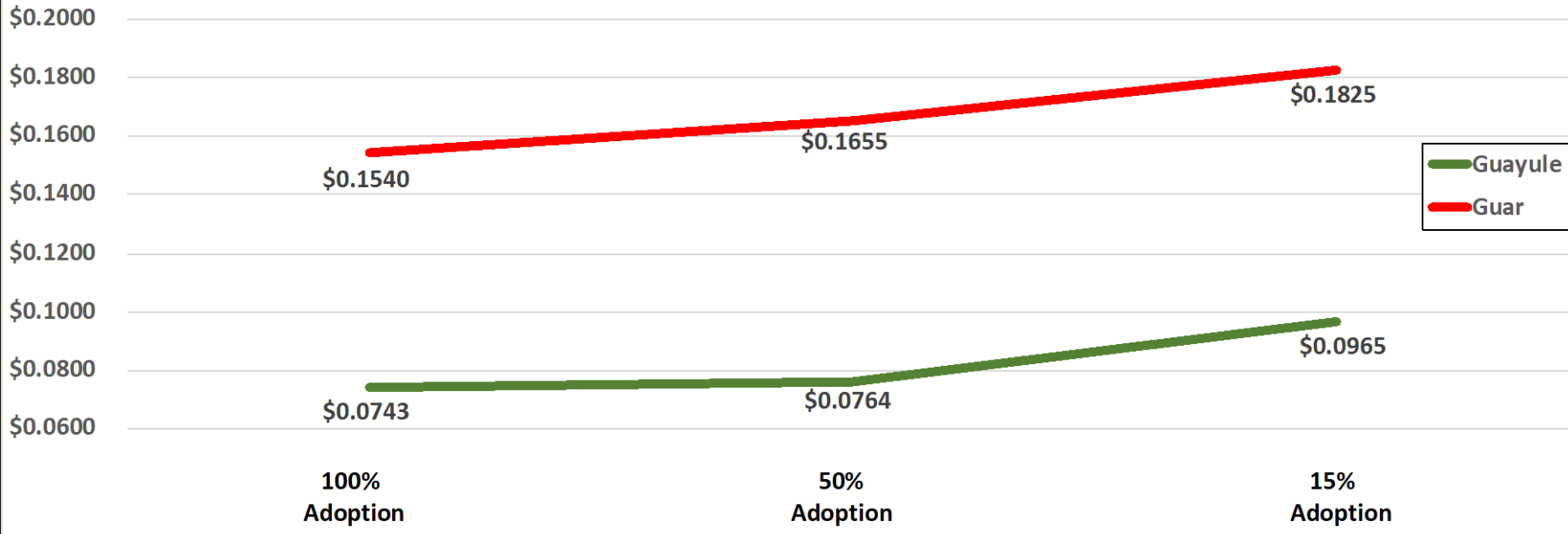
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### Breakeven Price to Grower Based on Adoption Rate into Current Cropping System \$/pound





Sensitivity Analysis: Net Present Value of Net Returns (Per Acre Per Year Average) of Establishing and Producing Guayule (**15% of the Total Farm Acres**) at Varying Biomass Prices, Yields, and Production Costs, \$/acre, **6% Discount Rate.**



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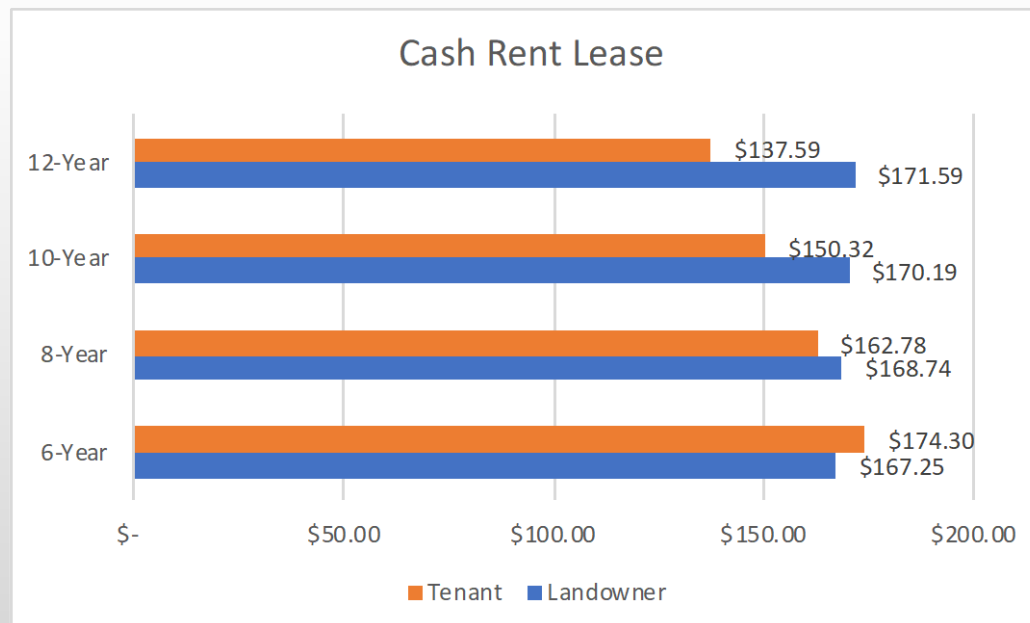
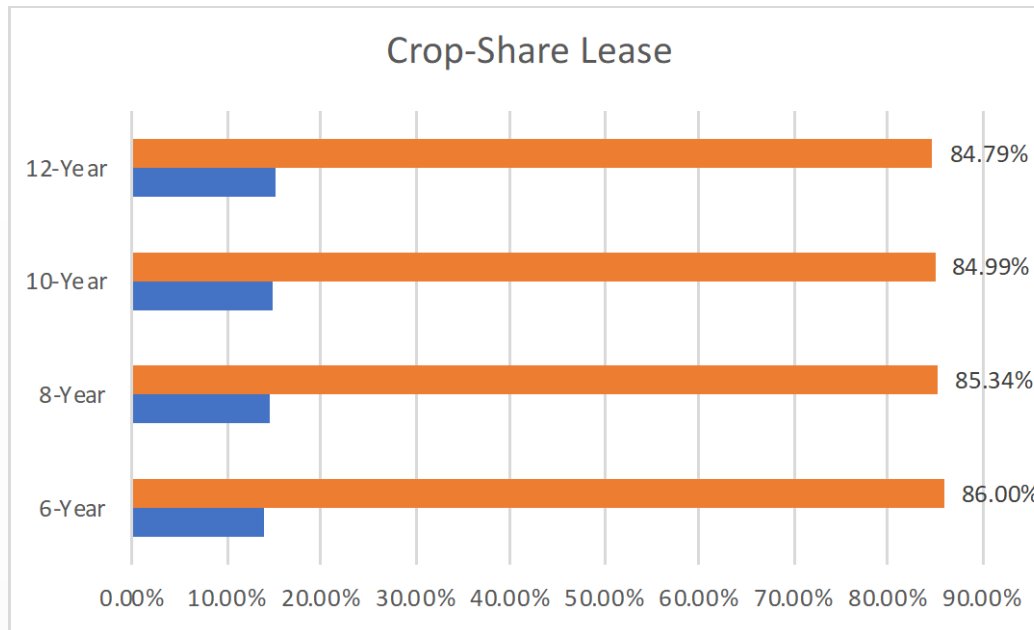
% of Production Costs from Base	Yield, Lbs/Acre	Guayule Price per Pound of Biomass				
		\$ 0.06	\$ 0.07	\$0.08	\$ 0.09	\$ 0.10
0%	19,000	(\$223)	(\$147)	(\$71)	\$4	\$80
	20,000	(\$199)	(\$119)	(\$40)	\$40	\$120
	21,000	(\$175)	(\$91)	(\$8)	\$76	\$159
	22,000	(\$151)	(\$63)	\$24	\$112	\$199
	23,000	(\$127)	(\$36)	\$56	\$147	\$239
	24,000	(\$103)	(\$8)	\$88	\$183	\$279
	25,000	(\$79)	\$20	\$120	\$219	\$318
-5%	19,000	(\$189)	(\$113)	(\$38)	\$38	\$114
	20,000	(\$165)	(\$85)	(\$6)	\$74	\$153
	21,000	(\$141)	(\$57)	\$26	\$110	\$193
	22,000	(\$117)	(\$30)	\$58	\$145	\$233
	23,000	(\$93)	(\$2)	\$90	\$181	\$273
	24,000	(\$69)	\$26	\$122	\$217	\$313
	25,000	(\$46)	\$54	\$153	\$253	\$352
5%	19,000	(\$256)	(\$181)	(\$105)	(\$30)	\$46
	20,000	(\$233)	(\$153)	(\$73)	\$6	\$86
	21,000	(\$209)	(\$125)	(\$42)	\$42	\$126
	22,000	(\$185)	(\$97)	(\$10)	\$78	\$165
	23,000	(\$161)	(\$69)	\$22	\$114	\$205
	24,000	(\$137)	(\$42)	\$54	\$149	\$245
	25,000	(\$113)	(\$14)	\$86	\$185	\$285





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# Summary



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- Benco Analysis Tool:
  - *Allows growers to see how new crops fit into their current operations*
  - *Inputs, price and yield assumptions easily adjusted*
- Enterprise budgets for each crop part of analysis for each scenario.
- Understanding the impact of the NPV to the farming operation is critical before adoption likely to occur.

For additional information and downloads go to the following website: